



**INTERIM
SURVEY METHODOLOGY FOR THE
NORTHERN APLOMADO FALCON
(*Falco femoralis septentrionalis*)
IN
DESERT GRASSLANDS**



**U. S. Fish and Wildlife Service
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(505) 346-2525**

May 20, 2003

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INTERIM

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INTRODUCTION

This interim protocol is intended to promote consistent and reliable surveys for evaluation by the U.S. Fish and Wildlife Service (Service) for proposed Federal actions or activities that may affect the aplomado falcon. The methods presented here are geared toward aplomados in the desert grasslands, but are generally applicable in all other portions of the species' range. Secondly, this methodology is designed to take a proactive approach in gathering baseline information on avian trends and habitat specifics in order to identify factors limiting the falcon's recovery as well as to provide conservation solutions for land management agencies. Heightened interest in the species follows from increased aplomado falcon presence in Texas and New Mexico, breeding pairs in the southern New Mexico grasslands, and aplomado falcons in northern Chihuahua, Mexico (Meyer *et al.* in review, Montoya *et al.* 1997, Young *et al.* 2002).

The Endangered Species Act of 1973, as amended, (Act) requires Federal agencies to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of a threatened or endangered species. Regulations implementing Section 7 of the Act require that Federal agencies (or their non-Federal designees) determine if any action they propose "may affect" any threatened or endangered species. If it is determined that a proposed action "may affect" an endangered or threatened species, then the agency is required to request formal Section 7 consultation with the Service. Section 7 also directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out programs for the conservation of endangered and threatened species. We anticipate that presence/absence surveys, along with baseline and habitat trend data would help address aplomado conservation or management needs.

This methodology was developed in response to agency/applicant requests for guidance in determining the presence of aplomado falcons for compliance under the Act. Surveys are often essential in determining effects to the species within potential or suitable habitat. This document is a guide and adherence to or disregard for the methodology does not, of itself, show compliance with or violation of the Act or other regulations. The methodology may be revised as knowledge of the species and its habitat increases, and as more efficient survey techniques come to light.

The northern aplomado falcon was listed as an endangered species by the Service in March, 1986. The falcon's extirpation as a breeding bird from the U.S. and evidence of population declines and high levels of pesticide contamination in eastern Mexico (Kiff *et al.*

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1978) were the primary justifications for its endangered status (51 FR: 6686-6690). Hector (1981, 1987) gives a thorough account of historical aplomado falcon occurrence in the U.S. from his investigations of museum collections and available literature. He noted that the aplomado falcon was a regular breeding species in the coastal grasslands of southern Texas, and the desert grasslands of western Texas, southern New Mexico, and southeastern Arizona until the early 1930s. Hector (1983, 1987) also reported that the highest aplomado nesting densities within the U.S. historically occurred in south-central New Mexico and southern Texas. Aplomado falcon populations in the U.S. declined dramatically during the 1930s-40s, possibly due to a combination of collecting pressure (Hector 1983, 1987) and adverse habitat modification (Ligon 1961; Hector 1981, 1987; Henry and Cathey 1995). Bayne (cited in Ligon 1961) noted the last known nesting pair of aplomados in the U.S., in May 1952, near Deming, Luna County, New Mexico.

Within New Mexico, aplomado falcons were historically reported from the southern tier of counties including Doña Ana, Eddy, Grant, Hidalgo, Lea, Luna, Otero, and Sierra. According to Henry and Cathey (1995), patches of suitable aplomado falcon habitat appear to remain in southern New Mexico. However, combinations of heavy grazing (Hector 1981), the encroachment of mesquite (*Prosopis glandulosa*), (Humphrey 1958; Buffington and Herbel 1965; Hector 1987; Henry and Cathey 1995), and proliferation of "weed" species such as snakeweed (*Gutierrezia* spp.) (Montoya, pers. obs.) may currently affect the habitat suitability of the aplomado in many areas of its former desert grassland range.

The Arizona Game and Fish Department (AGFD) (Ward and Ingraldi 1994) initiated grassland raptor/aplomado falcon surveys as a means of long-term monitoring of raptors, ravens, and loggerhead shrikes (*Lanius ludovicianus*) in the grassland communities of southeastern Arizona. The detection of any aplomado falcons occurring in Arizona and monitoring of specific areas with the potential for aplomado falcon reintroduction was of primary interest. Ward (AGFD, pers. comm. 1994) also reported that AGFD is investigating unconfirmed aplomado falcon reports from northern Sonora, Mexico.

For the next three decades since 1952, aplomado falcon sightings were few and widely scattered in New Mexico (Williams 1997) and have been reported sporadically throughout its historic U.S. range (J. Lewis, USFWS, pers. comm. 1991). Beginning in the 1990s, aplomado falcon reports began to increase as 27-32 falcons were reported in the southern part of New Mexico, with 3-6 observations occurring per year in the latter part of the decade (Meyer *et al.* in review). In 2000, not only had the high frequency of sightings continued, but pairs of birds and territories were being encountered in southern New Mexico. Although heightened awareness and vigilance likely contributed in part to the increase in reports, these observations indicate a significant and growing presence of the falcon in New Mexico (Meyer *et al.* in review). Aplomado falcons also occur in the desert grasslands of Chihuahua, Mexico and are a source for falcons occurring in New Mexico and West Texas. In addition, there is one account from near Marfa, Texas, in 1992 (Lasley and Sexton 1992) and another reliable account in 1996 near Van Horn, Texas. Beginning in 2002, banded, captive-bred aplomados have been released at sites in West Texas as part of a re-introduction effort.

NATURAL HISTORY

Identification

Aplomado falcons are long-tailed neotropical falcons intermediate in size between the American kestrel (*Falco sparverius*) and prairie falcon (*F. mexicanus*) (Hector 1983). The female aplomado being larger than the male, both sexes combined measure about 30-40 cm in length, have a wingspan of about 80-90 cm., and weigh about 250-500 grams (Hector 1988). In the U.S., aplomados may occur sympatrically throughout the year with the American peregrine falcon (*F. peregrinus anatum*), prairie falcon, American kestrel, and with merlin (*F. columbarius*) and Arctic peregrine falcon (*F. p. tundrius*) outside the breeding season. This emphasizes the need for careful observation to avoid confusion of suspected aplomado falcons with other more common falcons.

Adult aplomados can be distinguished from other North American falcons by their long tail and a distinct broad dark or black "cummerbund" on the lower breast, which at close range may show faint white barring (Figure 1-a). The tail is also crossed with several thin white bars. The upper breast is white to creamy and may have variable amounts of black streaking. The lower abdomen and undertail coverts are rufous. When viewed frontally at a distance, the falcon imparts a distinctive "tri-colored" (white-black-rufous) appearance. The back and dorsal wing surfaces are blue-gray or lead-colored (hence the Spanish name: *aplomado*). Facial markings are striking with a blackish cap and nape contrasted by a bold white supraorbital (facial) stripe that forms a "V" towards the nape; at close proximity, the stripes are white towards the face and become more rufous toward the nape. Immature aplomados are more brownish on the back and upperwing surfaces and the breast and facial stripes are cinnamon colored, with heavy streaking on the breast (Figure 1-c). Both adults and immature falcons have distinctive white trailing edges on the wings (Figure 1-b).

Flight profiles of both adult and immature aplomados are similar to other falcons, except for the longer tail. Flight is generally low and direct, though they will occasionally soar. Aplomado falcons pursue prey in a variety of fashions. They have been observed to pursue prey in direct linear flight, tower above prey and stoop (dive upon), and to "hawk" or snatch insects from a perch. Aplomados have been observed to pursue prey on the ground and pairs often hunt cooperatively (Hector 1986a; Montoya, pers. obs.). In addition, juvenile falcons released in South Texas have been noted to hunt cooperatively in groups (Perez, pers. obs.). Aplomados will occasionally follow coyotes and humans using them as "beaters", to capture flushed prey (Montoya, pers. obs.). Aplomados have also been known to steal prey caught by other raptors (kleptoparasitism) and hunt along the leading edges of grassfires (Perez, pers. obs.). Aplomados released in Texas are fitted with permanent black (female) or silver (male) anodized aluminum bands while the aplomados captured in Chihuahua, Mexico, were equipped with colored plastic leg bands (Montoya *et al.* 1997). The anodization used on the bands in Texas may fade with time.



(a) adult northern aplomado falcon
Chihuahua, Mexico.



(b) adult northern aplomado falcon
showing white trailing edge on
wing, Chihuahua, Mexico.



(c) immature northern aplomado falcon,
Laguna Atascosa NWR, Texas.



(d) northern aplomado falcon nest
site, Chihuahua, Mexico.

Figure 1. Photographs of adult (a) and (b), Chihuahua, Mexico, and immature (c) aplomado falcons, Laguna Atascosa NWR, showing plumage characteristics and an example of a nest site (d), Chihuahua, Mexico.

Habitat and Home Range

Aplomado falcons have been documented from a variety of open woodland, savanna, and grassland habitats (Hector 1981, USFWS 1990). Within the Chihuahuan desert, aplomados typically occur in open grassland areas with scattered mesquite and/or soap tree yucca (*Yucca elata*) or Torrey yucca (*Y. torreyi*) (Ligon 1961, Montoya *et al.* 1997) (Figure 2). Montoya *et al.* (1997) found that woody vegetation densities in aplomado home ranges in Chihuahua, Mexico, varied from 11.2 to 139.5 plants/hectare (ha) with no significant difference between nesting and non-nesting territories. Ground cover ranged from 28.9% to 69.5% on aplomado territories and also did not differ significantly between nesting and non-nesting territories (means equalled 49.9% versus 37.8%, respectively). Montoya *et al.* (1997) used the minimum convex polygon method to determine home range sizes for individual aplomados during the breeding season. Home range estimates for individual falcons monitored more than 100 days (n= 6) ranged from 3.3 to 21.4 km². Meyer *et al.* (in review) notes a territory of roughly 24 km² for a pair in southern New Mexico.

With respect to juvenile dispersal, a 1993-94 study of 28 radio-tagged aplomados released in South Texas revealed that from 2-6 months post-release, the movements of 14 monitored falcons did not permanently extend beyond 10 km from the 18,268 ha Laguna Atascosa National Wildlife Refuge boundary (Perez *et al.* 1996). At least 6 aplomado falcons with functioning transmitters were still in the general vicinity of the Refuge 6 months post-release; however, dispersals have been recorded for other released falcons. One male falcon dispersed 136 km north of the release area at an age of 70 days (Perez *et al.* 1996), and another male dispersed 22 km south of the refuge near Brownsville, Texas, in 1989 (Peregrine Fund, 1992). Daily linear movements of up to 55 km show the highly mobile behavior of young aplomados (Perez *et al.* 1996). Dispersal patterns between reintroduced and wild aplomados may be different. A juvenile female banded in Chihuahua, Mexico in May/June of 1999 was discovered in September of that year on Otero Mesa, Otero County, New Mexico, a distance of 300 km (R. Meyer, pers. obs.).

Breeding Chronology

Aplomado falcons appear to be resident across most of their northern range where populations currently exist in Mexico (Hector 1981; Montoya, pers. obs.). Ligon (1961) noted that aplomados tend to occur in pairs. Primary nesting occurs from March to June in northern Chihuahua and New Mexico, with courtship displays observed as early as late January and early February (Montoya, pers. obs., Meyer *et al.* in review). In the northwest portion of their range, aplomado falcons typically use stick nests constructed by other large bird species such as Swainson's hawks (*Buteo swainsoni*), Chihuahuan ravens (*Corvus cryptoleucus*), and possibly white-tailed kites (*Elanus leucurus*). Nests are usually situated in forks of yuccas (Figure 1-d), or in the tops of mesquite trees. In South Texas, an abandoned raven nest atop a 20-meter electrical tower was used by a pair of aplomados in 1995 (Peregrine Fund, unpubl. rpt.). Both sexes participate in an approximate 32-day incubation (Hector 1981), with young fledging approximately 35 days after hatching. Fledglings may remain in the vicinity of the nest for at least a month after fledging (Hector 1981; Meyer *et al.* in review, Perez, pers. obs.).



(a) suitable yucca/grassland habitat, Chihuahua, Mexico.



(b) suitable yucca/grassland habitat, Chihuahua, Mexico.



(c) suitable mesquite/grassland habitat, Chihuahua, Mexico.



(d) potential yucca/grassland habitat, Doña Ana County, New Mexico.

Figure 2. Photographs showing suitable (occupied) yucca/grassland habitat (a) and (b) and mesquite/grassland habitat (c), Chihuahua, Mexico, and potential (unoccupied) yucca/grassland habitat, Doña Ana County, New Mexico.

Diet and Prey Base

Research by Hector (1981), Jiménez (1993), and Montoya *et al.* (1997) show a wide array of birds, insects, mammals, and reptiles composing the aplomado diet. Ligon (1961) similarly reported from the New Mexico "open yucca desertland" that the food of the aplomado consists almost wholly of small reptiles, lizards, mice, other rodents, grasshoppers, and various other kinds of insects. Ligon (1961) also found aplomados feeding in the summer on bats in the Jornada del Muerto grassland, near Engle, New Mexico. Curiously, Ligon (1961) noted that small birds rarely comprised their diet, except in winter when other food is lacking.

In eastern Mexico, birds comprised 94% of individual prey items in remains examined and 35% of prey items seen captured, while insects comprised approximately 65% of prey items seen captured (Hector 1985). Additionally, Hector (1981) determined that 97% of the prey biomass consisted of birds in eastern Mexico. Montoya *et al.* (1997) found a similar preference for avian prey items with meadow larks (*Sturnella neglecta* and *S. magna*), common nighthawks (*Chordeiles minor*) and northern mockingbirds (*Mimus polyglottos*) among the most frequently taken birds in northern Chihuahua.

SURVEY METHODOLOGY

Surveyor Qualifications and Documentation

Individual observers are often the single greatest source of variability in any survey effort (Verner 1985); therefore, surveyors should be highly proficient in bird identification (particularly raptors/falcons), in correctly applying the survey methodology, and in exercising good common sense to avoid disturbing sensitive species or habitat during the course of the surveys. Nonetheless, since specific surveys for aplomado falcons may involve a disruption of normal behavioral activities such as feeding, roosting, or nesting, surveyors should possess a valid Federal permit pursuant to Section 10(a)(1)(B). Endangered species permit applications may be obtained by writing to: U.S. Fish and Wildlife Service; Ecological Services Division; *Attn: Permits*; P.O. Box 1306; Albuquerque, NM 87103-1306. If there are any questions about Federal permits, the appropriate Service Field Office or the Service's Regional Permits Office should be contacted for clarification prior to undertaking survey activities. It may also be necessary to contact the appropriate state agency regarding their permitting requirements. Aplomado observations should be reported immediately to the Ecological Services Field Office and the endangered species/non-game branch of the appropriate state game and fish department (Appendix A). All observations of aplomado falcons should be thoroughly described using the format provided in Appendix B. Photographs of any identified or suspected aplomado falcons should also be taken and submitted to the above agencies.

Survey Design Goals

There are two types of surveys. The first, and more desirable of the two survey types, involves system or basin-wide surveys encompassing an entire grassland area (*i.e.*, Otero Mesa) that is similar to AGFD's grassland raptor surveys (Ward and Ingraldi 1994). These

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surveys would be conducted at regular intervals in a scientifically rigorous fashion. The goal of system-wide surveys is to provide reliable data for incorporation into project design or large-scale programs. This methodology can provide the quantifiable data to monitor trends in avian species abundance over time. Trend data are often necessary and missing elements in the proper evaluation of large scale projects/programs. System-wide surveys are basically intended to address large scale projects or programs occurring over a long period of time. Often, the effects of such projects/programs on the falcon or its habitat are more subtle than the more apparent impacts of a specific or localized project and thus, the analysis of those usually requires such baseline habitat or trend information.

The second survey type is the project-specific survey that focuses on determining aplomado falcon presence and habitat suitability in an identified area before an "action" takes place. This survey method is for projects that are brief, have specific impacts, and where trend data are not necessary. Procedures described in the system-wide and project-specific survey types are outlined in Table 1 (Page 13).

Basic Equipment

Three pieces of optical equipment are essential to conducting aplomado falcon surveys. These include: (1) a quality pair of binoculars of at least 8x with good light gathering capability, (2) a spotting scope of at least 20x to observe raptors detected at greater distances, and (3) a camera with a telephoto lens powerful enough to produce identifiable photos (*i.e.*, at least a 200mm telephoto lens). Color slide film is preferred so that photos can be easily magnified for more detailed inspection at a later date. The Service recommends this equipment be used to allow an observer to watch an individual bird from a sufficient distance that does not result in behavioral changes, particularly in nesting situations.

SYSTEM-WIDE SURVEYS

Survey Objectives

System-wide surveys provide a proactive approach to monitoring avian trends and assessing habitat characteristics important in conservation and recovery of aplomado falcons. This survey protocol generally follows that of established Breeding Bird Surveys (BBS) and, more specifically, procedures described by Ward and Ingraldi (1994) for Arizona. This methodology is intended to help address long term aplomado falcon management for large scale projects, actions, or programs occurring over time where important baseline/trend information is needed.

Survey Area and Route Selection

Survey areas should consider historical or potential occurrence of aplomado falcons and/or the existence of potential habitat within the action area. In this document, potential habitat is any range or grassland containing prominent but scattered woody vegetation as described earlier in the *Habitat and Home Range* section. More specific habitat information may be obtained through literature such as the descriptions by Hector (1981, 1986b, 1987) and/or the desert grassland habitat descriptions found in Dick-Peddie *et al.*

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(1993), and Young *et al.* (2002). Topographic and vegetation maps can also help in the process of determining survey areas/routes within potential habitat. Once a specific survey area is determined, routes can be selected through the use of current maps showing existing roads. This methodology assumes existing roads are available for adequate coverage. However, we recommend coordinating with the appropriate Service Field Office beforehand for any site-specific concerns regarding survey areas and/or routes. Survey routes should be a minimum of 16 km (10 mi) in length, with survey points every 0.8 km (0.5 mi). The maximum length of survey routes is flexible but limited by the survey time frames defined in the next section. If a point is located where the view is obstructed, the surveyor should move a short distance (*i.e.* within a radius of 100m) until a clear view is obtained. If a system is particularly large or the roads disjunct, two or more routes may be designated within the survey area to provide adequate coverage. Adequate coverage would generally consist of the minimum number of routes needed to "view" all portions of the action area containing potential habitat. Survey routes and observation points within the action area should all be clearly indicated on U.S. Geological Survey (USGS) 7.5 minute topographic maps.

Survey Periods and Weather Constraints

Although aplomado falcons are believed to inhabit their range year-round (USFWS 1990), they are most conspicuous during their breeding season. Therefore, the majority (approximately 2/3) of system-wide surveys should be conducted between 1 February and 31 August, which represents the timing for the major portion of the courtship, nesting, and post-fledging season. For example, if six surveys are planned, four should be conducted between the above mentioned dates while the other two could be conducted during the winter months. Surveys within and outside the breeding season should be evenly spaced but not more frequent than a 2-4 week interval of each other, to minimize temporal biases. Minimum survey requirements are provided here; however, the greater the survey effort, the greater the probability of detecting rarer species.

Time and weather restrictions are necessary to ensure that surveys are conducted when detectability will not be biased due to wind, precipitation, or temperature (Verner 1985). Falcons most actively hunt in the mornings and evenings (Robbins 1981a; Montoya, pers. obs.). Wind and precipitation not only impair an observer's ability to detect wildlife (Verner 1985), but have been documented to cause behavioral changes in raptors to avoid inclement weather (Bildstein 1978, Wilkinson and Debbon 1980, Robbins 1981b). Therefore, to minimize time and weather period variability, surveys should be conducted in the mornings from sunrise to 4 hours after sunrise. Weather information should be recorded on the survey data form at the beginning of the survey; any changes in the weather during the course of the survey should also be noted. Surveys should only be conducted when there is no precipitation and sustained wind speeds are ≤ 16 kph (≤ 10 mph). Wind speeds can be roughly estimated against a standard such as the Beaufort Scale where wind speeds less than 16 kph can be characterized as calm to a gentle breeze which extends lightweight flags. Wind conditions that raise dust or loose paper would generally not be good survey conditions.

Survey Data Collection

Data collected for system-wide surveys should, at a minimum, include all raptors and ravens observed. Raptor-like species, such as the loggerhead shrike, should also be surveyed (Ward and Ingraldi 1994). In addition, the Service recommends the counting and identifying of all avian species at these survey points (similar to the BBS) since this can give a valuable index of avian prey availability for aplomado falcons. For documentation of the full complement of avian species within the survey area, all auditory and visual detections should be recorded similar to the BBS protocol. This requires a knowledge of species' calls and songs as well as visual identification proficiency. We recommend including general vegetational notes and habitat descriptions of the action area with some emphasis on the relative grass cover height/types and the spacing of prominent woody vegetation/types. Hector (1986b) describes the relative importance of vegetative structure and patterns of aplomado habitat for reference.

During the aplomado falcon survey, a single "qualified" observer will stop at each observation point (exit the vehicle) and spend a minimum of 10 minutes listening and scanning the sky and all potential perch sites in a 360° area for the desired species. Binoculars and spotting scopes should be used to positively identify individual birds at a distance. A second person may record, but all observation data should be collected by one observer. Once the desired data are recorded, move directly to the next observation point to minimize recounting individuals. Individuals seen from one point should not be recounted at another.

Nest site availability appears to be a limiting factor for the aplomado, since they do not construct their own nests but utilize the abandoned nests of other raptors and ravens. Therefore, the documentation of stick nests will assist in the assessment of habitat suitability. All raptor and raven nests (large stick nests) located in the course of the survey should be tallied and their location marked on USGS 7.5 minute topographic maps. Data collected for each nest site should include nesting activity and species identification (if active). View all suspected aplomado nests from a distance of 75-100 meters with binoculars or a spotting scope to avoid causing any nest disturbance and possible abandonment. Surveyors should be aware that, with the exception of rock doves, house sparrows, and European starlings, migratory birds and their nests/eggs are protected under the provisions of the Migratory Bird Treaty Act.

PROJECT-SPECIFIC SURVEYS

Survey Objectives

Project-specific surveys are designed to determine the presence of aplomado falcons occurring in potential habitat within an action area. Depending on the project, the action area may also include sites indirectly or cumulatively impacted by the project and related activities. Efforts will be directed at intensively surveying all habitat within the action area having the potential of supporting aplomado falcons. Habitat of primary interest includes grasslands with a scattered, but prominent, woody component such as yucca and/or mesquite. However, potential habitat may vary somewhat across the region as to the

specific plant species composition. Habitats marginal in suitability (*i.e.* habitats that are dominated by woody vegetation rather than grass) will have lower priority for survey efforts. Since this survey type is to detect the presence of aplomado falcons for localized actions, rather than including monitoring trends or repeatable data collection, project-specific surveys are designed to be more flexible but intensive.

Survey Area and Route Selection

Survey areas should consider historical or potential occurrence of aplomado falcons and/or the existence of potential habitat within the action area. Potential habitat is any range or grassland containing scattered and prominent woody vegetation, as described earlier. More specific habitat information may be obtained through literature such as the descriptions by Hector (1981, 1986b, 1987) and/or the desert grassland habitat descriptions found in Dick-Peddie *et al.* (1993), and Young *et al.* (2002). As with the system-wide method, survey areas and routes should be coordinated with the respective Service Field Office beforehand to address any concerns. Topographic and vegetation maps can also help in the process of determining survey areas. Survey routes should be delineated in a manner that provides a complete look of all potential habitat within the action/impact area. Routes will vary in number and length, depending on size of the project area and amount of potential habitat to be surveyed. Observation points for road surveys should be located every 0.5 to 1.2 km (0.3 to 0.75 mi), depending on visibility and habitat priority. If a given observation point has an obstructed view of the surroundings, the surveyor should move a short distance (*i.e.* within a radius of 100m) in order to alleviate the constrained view. If the potential habitat and/or project area is large, multiple routes will need to be designated within the area for adequate coverage. The project action area, habitat types, survey routes, and observation points should all be clearly indicated on USGS 7.5 minute maps.

Fuller and Mosher (1987) state that foot surveys produce lower detection rates but can give a thorough survey of small areas. Pedestrian surveys are recommended for small patches of habitat, particularly when vehicle access is limited, and are to be considered a continuous survey rather than a point survey. The maximum length of pedestrian survey routes is determined by the project area but limited by survey time frames defined in the next section.

Survey Periods and Weather Constraints

Survey periods are designed to maximize the likelihood of detecting aplomado falcons based on known behavior patterns, activity periods, and coincident with the proposed project/activity. Although aplomados may inhabit their range year-round, they will be most conspicuous from 1 February to 31 August, which represents the time period for courtship, nesting, and the post-fledging season (Hector 1981; USFWS 1990; Montoya *et al.* 1997). Therefore, to maximize the likelihood of detecting aplomado falcons, surveys are best conducted during this time period. Surveys should normally be conducted prior to initiation of each proposed project activity or prior to each phase of an action that may affect the aplomado falcon or its habitat. Additionally, sufficient lead time is needed for adequate survey coverage and for Service coordination (*i.e.*, to review the survey results and respond before the anticipated start of the proposed action). Surveys of potential

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habitat within a given project area for aplomado falcons should be conducted at least 3 times within a 3-4 week period and conclude at least 30 days prior to the anticipated start date of the project. To minimize temporal biases, surveys should not be repeated during the same day but spread out as much as possible by at least 1 week intervals. For specific projects/actions in which the implementation of the above survey interval is constrained, the appropriate Service Field Office should be contacted for specific recommendations. Keep in mind that survey efforts need be timed as closely as possible to the start of the project/action. This survey series is intended to maximize the likelihood of detection, particularly outside the nesting season.

Weather and time constraints are necessary to ensure that surveys are conducted when detectability is not limited by wind, precipitation, or temperature. Therefore, surveys in potential habitat should be conducted in the mornings from sunrise to 4 hours after sunrise. Weather information should be recorded on the survey data form at the beginning of the survey and any changes in the weather should be noted during the course of the survey. Supplemental surveys may be conducted in marginal habitat in the evenings from 4 hours before sunset to sunset; however, these may not replace morning surveys in potential habitat. Surveys should only be conducted when there is no precipitation and sustained wind speeds are ≤ 16 kph (≤ 10 mph), determined against a standard such as the Beaufort Scale.

Survey Data Collection

For project-specific surveys, all raptors will be recorded. At each point, the biologist will (exit the vehicle) scan 360° for at least 10 minutes for flying or perched raptors. Provided that the permitted biologist is present, more than one observer may be used, since coverage and detection are the primary objectives.

Documentation of nest availability or stick nests that can be used by aplomado falcons will help assess habitat suitability and impact avoidance. Therefore, all raptor and raven nest sites located in the course of the survey should be tallied. View all active nests, particularly suspected aplomado nests, from a distance of 75-100 meters with binoculars or a spotting scope to avoid causing any nest disturbance and possible abandonment. If the adults appear to become agitated at your presence, retreat from the nest area. All raptors and ravens are protected under the provisions of the Migratory Bird Treaty Act.

See Table 1 for a summary of both survey procedures.

Table 1. Summary of Survey Methodologies

Survey Constraints	System-Wide Survey	Project-Specific Survey
Observers	One observer	One or more observers
Survey Period	All year, 2/3 of surveys during 1 February - 31 August.	All year; Timed to coincide with proposed activity.
Survey Times	Sunrise to 4 hours after.	Sunrise to 4 hours after, supplemental from 4 hours before sunset to sunset.
Survey Frequency	Once every 2-4 weeks flexible, but suggest a minimum of 4 surveys if between 1 Feb- 31 Aug.	Minimum of 3 survey visits over 3-4 weeks (spaced at 1 per week) in potential habitat/action area concluding within 30 days prior to project start date.
Precipitation	None	None
Survey Mode	Vehicle	Vehicle or walking
Wind Speed (Sustained)	≤ 16 kph (≤ 10 mph)	≤ 16 kph (≤ 10 mph)
Survey Route	Minimum length of 16 km (10 mi). May be longer. Coordinate with Service on survey area/routes.	Variable, to effectively cover action area. Coordinate with Service on survey area/routes.
Observation Points	Every 0.8 km (0.5 mi)	Variable, every 0.5 to 1.2 km (0.3 to 0.75 mi) if by vehicle, continuous if by walking.
Observation Time	10 minutes per point.	Variable, minimum of 10 minutes per point if by vehicle.
Species Recorded	All raptors, ravens, shrikes. (all avian species recommended for trend) Vegetation/habitat notes recommended.	All raptors and/or ravens.
Nests Recorded	Record location, species, and activity for all large nests if possible.	Tally all large stick nests.
End. Species Permit	Required.	Required.

AGENCY RESPONSIBILITIES

Report Preparation

Upon completion of each project-specific survey, the action agency/surveyor will prepare a report on the results of the survey and associated information. If an aplomado falcon is located during surveys, the action agency/surveyor should contact the appropriate Service Field Office project biologist within 3 working days. Survey results submitted to the Service should include: (1) maps of survey route(s), (2) survey data forms, (3) a narrative of the results and any observations of interest (*i.e.*, other species of interest, notes on habitat suitability, and nest availability), and (4) photos documenting aplomado falcons and/or habitat. In order to ensure a timely response to the agency/applicants, survey results are requested in writing as soon as possible (particularly for project-specific actions). System-wide survey reports/activities may be submitted on an annual basis or unless otherwise decided upon during agency coordination with the Service.

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A-1 Appendix A. List of contacts to report aplomado sightings (contact coordinating Service Field Office). Also on the Internet at: <http://southwest.fws.gov/index.html>

ARIZONA

Field Supervisor
U.S. Fish and Wildlife Service
Arizona Ecological Services Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4957
(602) 242-0210
FAX (602) 242-2513

(State agency)
Arizona Game and Fish Department
Nongame and Endangered Wildlife
2221 West Greenway Road
Phoenix, Arizona 85023-4312
(602) 789-3514
FAX (602) 789-3926

NEW MEXICO

(Lead recovery station)
Field Supervisor
U.S. Fish and Wildlife Service
New Mexico Ecological Services Office
2105 Osuna Road NE
Albuquerque, New Mexico 87113
(505) 346-2525
FAX (505) 346-2542

(State agency)
Sandy Williams
New Mexico Department of
Game and Fish;
Endangered Species Division
P.O. Box 25112
Santa Fe, New Mexico 87504
(505) 476-8000
FAX (505) 476-8128

TEXAS

(West Texas)

Field Supervisor
U.S. Fish and Wildlife Service
Ecological Services Office
10711 Burnet Road, Suit 200
Hartland Bank Building
Austin, Texas 78758
(512) 490-0057
FAX (512) 490-0974

(State agency)

Texas Parks and Wildlife Department
Threatened and Endangered Species
4200 Smith School Road;
Austin, Texas 78744
(512) 912-7011
(800) 792-1112

(South Texas)

Field Supervisor
U.S. Fish and Wildlife Service
c/o TAMU-CC Campus Box 338
6300 Ocean Drive
Corpus Christi, TX 78412
(361) 994-9005
FAX (361) 994-8262

A-2 Appendix B. Rare bird/aplomado falcon observation form.

RARE BIRD/APLOMADO FALCON OBSERVATION FORM

Observer(s): _____

Sighting Date: __ __. __ __ __. __ __ (ex. 01.Mar.95)

Phone Number(s) of Primary Contact on this Observation(____) (____)

General Area Description: _____

Site Location: UTM Coordinates _____ E _____ N Elevation: _____

Lat/Long Coordinates T _____ R _____ Sec(s) _____

Quadrangle (Topographic) Map Name _____

Please include a map of location, preferably from a USGS 7.5 minute quad, on the back.

Sighting Time: First Observed _____ End Observation _____ (24hr time)

Weather: Wind Speed (max) _____ Temperature (max) _____ °F °C Cloudcover % _____

DESCRIPTION

Observation Distance _____ Lighting _____ Photographs Y N

Status (*i.e.* single, pair, adult, subadult, or juvenile) _____

Back and Upperwings _____

Face, Head, and Nape _____

Breast, Belly, and Underwings _____

Tail, Rump, and Undertail Coverts _____

Flesh Parts (legs and Cere) _____

Behavior _____

Notes: _____

A-3 Appendix C. Field data forms.

APLOMADO FALCON SURVEY DATA FORM

Survey Route Description:_____

County:_____ USGS Quad Name(s):_____

Survey Location: UTM Coordinates _____E _____N Elevation:_____

Lat/Long Coordinates T___ R___ Sec(s)_____

Survey Date:___ . ___ . ___ Survey Time: Start _____End _____

Day Month Year

Weather: Wind Speed (max)_____ Temperature (max) _____ Cloudcover % _____

Primary Observer:_____ Other Observer(s):_____

Survey mode: Vehicle___ Walk___

Individual Species Observed by Station:

TUVU BLVU◆ GOEA BAEA MIKI BSKI NOHA SSHA COHA NOGO
BWAH RTHA SWHA RLHA FEHA WTHA◆ HAHA ZTHA OSPR **APFA**
CRCA◆ AMKE MERL PRFA PEFA CORA CHRA AMCR LOSH

* = Large stick nest present. ◆ = unlikely, needs verification

1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	

Notes_____

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Appendix C (continued). Key to the abbreviated avian species.

TUVU	BLVU	GOEA	BAEA	MIKI	BSKI	NOHA	SSHA	COHA	NOGO
BWHA	RTHA	SWHA	RLHA	FEHA	WTHA	HAHA	ZTHA	OSPR	APFA
CRCA	AMKE	MERL	PRFA	PEFA	CORA	CHRA	AMCR	LOSH	

TUVU - Turkey Vulture

BLVU - Black Vulture

GOEA - Golden Eagle

BAEA - Bald Eagle

MIKI - Mississippi Kite

BSKI - Black-shouldered Kite (or white-tailed kite)

NOHA - Northern Harrier

SSHA - Sharp shinned Hawk

COHA - Cooper's Hawk

NOGO - Northern Goshawk

BWHA - Broad-winged Hawk

RTHA - Red tailed Hawk

SWHA - Swainson's Hawk

RLHA - Rough legged Hawk

FEHA - Ferruginous Hawk

WTHA - White tailed Hawk

HAHA - Harris' Hawk

ZTHA - Zone tailed Hawk

OSPR - Osprey

APFA - Aplomado Falcon

CRCA - Crested Caracara

AMKE - American Kestrel

MERL - Merlin

PRFA - Prairie Falcon

PEFA - Peregrine Falcon

CORA - Common Raven

CHRA - Chihuahuan Raven

AMCR - American Crow

LOSH - Loggerhead Shrike

XXXX - Other (identify)